

第一部分：

1. Define the following terms: meta-data, weak entity type, relation state, lossless join property, OLAP. (10%)
2. Discuss the entity integrity and referential integrity constraints. Why is each considered important? (10%)
3. List the three main approaches to database programming. What are the advantages and disadvantages of each approach? (10%)
4. Consider the relation REFRIG(Model#, Year, Price, Manuf_plant, Color), which is abbreviated as REFRIG(M, Y, P, MP, C), and the following set F of functional dependencies: $F = \{M \rightarrow MP, \{M, Y\} \rightarrow P, MP \rightarrow C\}$.
 - a. Evaluate each of the following as a candidate key for REFRIG, giving reasons why it can or cannot be a key: $\{M\}$, $\{M, Y\}$, $\{M, C\}$. (5%)
 - b. Based on the above key determination, state whether the relation REFRIG is in 3NF and in BCNF, giving proper reasons. (5%)
5. How is the concept of a relational view related to a data warehouse and data marts? In what way are they different? (10%)

第二部分：

1. Consider the AIRLINE relational database schema shown below, which describes a database for airline flight information. Each FLIGHT is identified by a Flight_number, and consists of one or more FLIGHT_LEGs with Leg_numbers 1, 2, 3, and so on. Each FLIGHT_LEG has scheduled arrival and departure times, airports, and one or more LEG_INSTANCES – one for each Date on which the flight travels. FAREs are kept for each FLIGHT. For each FLIGHT_LEG instance, SEAT_RESERVATIONS are kept, as are the AIRPLANE used on the leg and the actual arrival and departure times and airports. An AIRPLANE is identified by an Airplane_id and is of a particular AIRPLANE_TYPE. CAN_LAND relates AIRPLANE_TYPES to the AIRPORTs at which they can land. An AIRPORT is identified by an Airport_code.
Specify the following queries in relational algebra and SQL.

- a. For each flight, list the flight number, the departure airport for the first leg of the flight, and the arrival airport for the last leg of the flight. (10%)
- b. List the flight numbers and weekdays of all flight or flight legs that depart from Houston International Airport (airport code 'LAH') and arrive in Los Angeles International Airport (airport code 'LAX'). (10%)

AIRPORT

<u>Airport_code</u>	Name	City	State
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FLIGHT

<u>Flight_number</u>	Airline	Weekdays
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FLIGHT_LEG

<u>Flight_number</u>	<u>Leg_number</u>	<u>Departure_airport_code</u>	<u>Scheduled_departure_time</u>
		<u>Arrival_airport_code</u>	<u>Scheduled_arrival_time</u>

LEG_INSTANCE

<u>Flight_number</u>	<u>Leg_number</u>	<u>Date</u>	<u>Number_of_available_seats</u>	<u>Airplane_id</u>
		<u>Departure_airport_code</u>	<u>Departure_time</u>	<u>Arrival_airport_code</u>
				<u>Arrival_time</u>

FARE

<u>Flight_number</u>	<u>Fare_code</u>	Amount	Restrictions
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AIRPLANE_TYPE

<u>Airplane_type_name</u>	Max_seats	Company
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CAN_LAND

<u>Airplane_type_name</u>	<u>Airport_code</u>
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AIRPLANE

<u>Airplane_id</u>	Total_number_of_seats	Airplane_type
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SEAT_RESERVATION

<u>Flight_number</u>	<u>Leg_number</u>	<u>Date</u>	<u>Seat_number</u>	Customer_name	Customer_phone
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2. Discuss the correspondences between the ER or EER model constructs and the relational model constructs. Show how each ER or EER model construct can be mapped to the relational model and discuss any alternative mappings. (10%)
3. Discuss the advantages and disadvantages of using (a) an unordered file, (b) an ordered file, and (c) a static hash file with buckets and chaining. Which operations can be performed efficiently on each of these organizations, and which operations are expensive? (10%)
4. Discuss in details the decisions made during physical database design. (10%)